

The invention claimed is:

1: A micromachined pixel structure sensitive to incident low-level

photonic radiation of microWatts and less comprising:

- a planar substrate covered with a patterned metallic mirror;
- a platform formed above said mirror and substrate by the sacrificial etching away of an initially underlying film and with said platform connected to said substrate by means of tetherbeams of low thermal conductivity;
- a pyro-optical film integral to said platform in which the optical transmission through the pyro-optical film for a topside-incident optical carrier beam is modulated by the platform temperature;
- said pyro-optical film of a thickness so as to form a first Fabry-Perot structure which maximizes the thermal modulation index for said optical transmissivity;
- said platform and said underlying metallic mirrored substrate forming a second Fabry-Perot structure which maximizes the absorption of incident low-level radiation within the platform;
- and where the amplitude of said optical carrier beam is sensed by an integral or external photodetector with circuits for gating control of said photodetector readout.

2: The pixel structure of claim 1 with said patterned metallic mirror containing a transmission path permitting the topside optical carrier beam to pass through and into an external photodetector where the amplitude of the optical carrier beam is quantified.

3: The pixel structure of claim 1 where said platform contains a resistive heater element integral to said platform and with electrical interconnections formed within said tether beams and utilizing an external source of electrical power for the purpose of controlling the nominal temperature of said platform

4: The pixel structure of claim 1 arranged as a one-dimensional or two-dimensional planer array for the purpose of imaging the low level radiation.

5: The pixel of claim 1 wherein incident, periodically chopped, low-level radiation is absorbed in said platform causing it's temperature and the amplitude of the optical carrier beam detected by said photodetector to fluctuate in a similar periodic fashion; and where the readout of said detector is gated in synchronization with said chopped low-level radiation thereby forming a synchronous detector for the purpose of increasing the signal-to-noise ratio of the detected low-level radiation.

6: The pixel of claim 1 containing a first electrode positioned above a second substrate electrode to form an electrostatic actuator in which the first electrode formed within said platform is periodically moved between physical-contact and no-physical-contact positions under external voltage control to provide positions of minimum thermal sensitivity and maximum thermal sensitivity, respectively, and where the response of said photodetector is gated in synchronization with said external voltage control for the purpose of synchronous detection to increase the signal-to-noise ratio of the detected low-level radiation.

7: The pixel of claim 6 where the electrostatic actuation incrementally controls the gap of said second Fabry Perot structure providing a means of tuning the infrared response over a selected spectral range.

8: The pixel of claim 2 where the heater current in said heater element is modulated to cause a thermal dithering and thermal cycling of the temperature of said platform in time synchronization with the gating of the external detector for the purpose of increasing the signal-to-noise ratio of the detected low-level radiation.

9: The pixel of claim 2 where the heater element causes a periodic large deflection of the platform as a result of the difference in temperature coefficients of expansion in the bimorph tether beams in which the platform physically touches the underlying substrate for the purpose of desensitizing the pixel to low level radiation thereby eliminating the need for an external chopper.

10: The pixel of claim 1 where the amplitude of the optical carrier beam is modulated with a periodic waveform and the carrier beam response in the photodetector is gated in synchronization with said optical beam modulation for the purpose of increasing the signal-to-noise ratio of the detected low-level radiation.

11: The pixel of claim 1 with a heater element external to the platform maintaining said substrate at a controlled nominal temperature.

12: The structure of claim 1 where said platform includes an integral thermister serving as a temperature sensor with an electrical interconnect through the tether beams to external control circuits for the purpose of monitoring and controlling the temperature of said structure.

13: The pixel of claim 1 where the pyro-optical film is an oxide of vanadium operated in the temperature range 55 to 75 deg C.

14: The pixel of claim 1 where the source of the optical carrier beam includes one or more of filtered incandescent optical sources and pn junction photosources fabricated of

gallium arsenide or gallium nitride or alloys thereof including GaAsP, GaAlN, and InGaN.

15: The pixel of claim 1 where said sacrificial layer is polyimide and said tether beams include silicon dioxide.

16: The pixel of claim 1 where said sacrificial layer is silicon and said tetherbeams contain silicon dioxide.

17: The pixel of claim 1 arranged into an array with support posts of individual platforms shared by adjacent pixels thereby reducing the overall substrate area required and increasing the fill factor.

18: The structure of claim 1 with said photodetector integrated into said planer substrate.

19: The structure of claim 1 operated within a conventional vacuum chamber enclosure.